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GEOGRAPHICAL NOTES

UPON

RUSSIAN AMERICA

AND

THE STICKEEN RIVER,

BEING

A REPORT ADDRESSED TO THE HON. W. H. SEWARD,
SECRETARY OF STATE,

BY WILLIAM P. BLAKE.

WITH A MAP OF THE STICKEEN RIVER.

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WASHINGTON:
GOVERNMENT PRINTING OFFICE
1868.

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RUSSIAN AMERICA.

MESSAGE
FROM THE
PRESIDENT OF THE UNITED STATES,
IN ANSWER TO

A resolution of the House of 19th December last, calling for information relative to Russian America.

APRIL 21, 1868.—Referred to the Committee on Foreign Affairs and ordered to be printed.

To the House of Representatives :

In further reply to the resolution adopted by the House of Representatives on the 19th of December, 1867, calling for correspondence and information in relation to Russian America, I transmit a report from the Secretary of State and the papers which accompanied it.

ANDREW JOHNSON.

WASHINGTON, April 2, 1868.

DEPARTMENT OF STATE,
Washington, April 2, 1868.

The Secretary of State, referring to his report of the 17th of February last, placing before the President a copy of the correspondence called for by the resolution of the House of Representatives of the 19th of December, 1867, in relation to Russian America, has the honor to lay before the President, as supplemental to that report, the accompanying notes upon that subject, and a map of the Stickeen river, by Professor W. P. Blake, of California.

Respectfully submitted :

WILLIAM H SEWARD.

THE PRESIDENT.

WASHINGTON, March, 1868.

Sir: At the expiration of my engagement with the Tycoon's government in Japan, I received permission from the commodore of his imperial Russian Majesty's squadron, in the north Pacific, to accompany Commander Bassarguine, of the corvette Rynda, to Russian America.

We left Hakodadi on the 22d of April, 1863, and were 22 days under sail crossing to Sitka, arriving there on the 14th day of May.

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During my stay there I received much attention from the governor and other officials, and gathered some general and special information upon the nature and resources of the country, which I have embodied in the following pages.

From Sitka the corvette sailed to the mouth of the Stickeen river, and a survey of the lower portion of this stream was made by the Russian officers. Three parties were fitted out: one to make soundings and a map of the estuary; one to survey and sound the channel for some 30 miles up, (probably to the supposed boundary;) and a third party to ascend the river as far as possible in the two weeks allowed for explorations.

As this river had not been ascended by any exploring party, and the nature of the country along it, and even the course of the river was unknown to geographers, I accepted an invitation to join the expedition. The results of my observations, together with my journal and a sketch-map of the stream, are appended.

I have the honor to be, very respectfully, your obedient servant,

WILLIAM P. BLAKE.

Hon. WILLIAM H. SEWARD,

Secretary of State, Washington.

NOTES UPON THE GEOGRAPHY AND GEOLOGY OF RUSSIAN AMERICA AND THE STICKEEN RIVER, FROM OBSERVATIONS MADE IN 1863.

THE COAST OF ALASKA IN THE VICINITY OF SITKA.

On approaching the northwest coast of America from the Pacific the mountain chains of the interior are seen to be lofty and Alpine in character. The ridges are sharply serrated and rise into needle-like pinnacles, giving an outline against the sky that contrasts strongly with the gently-sloping sides of the truncated cone of Edgecombe, a fine, extinct volcano which marks the entrance to the harbor of Sitka. This mountain and the ranges along the coast are densely wooded with pines, firs, and spruce, but the upper portions or summits are without vegetation, being shrouded in snow. This often appears to be in immense drifts and overhanging masses upon the crests of the range. In the winter and as late as May this snow stretches far down the sides of Edgecombe and buries the upper portions of the forest from sight, or leaves only the tops of the tall spruces protruding from the snow, like little shrubs.

Some of the principal valleys of the mountain range of the mainland are filled with magnificent glaciers, rivalling those of the Alps. No glaciers are found upon the coast at Sitka, or south of it, for under the influence of the warm currents of the Pacific the climate is comparatively mild, while a short distance in the interior, beyond the influence of the warm currents, the climate is more severe, and the winters and summers are strongly marked.

The topography of the interior opposite Sitka has been almost unknown. The Stickeen river, for example, (known also as the Frances river,) is usually represented as running nearly east and west, and as heading far to the south of its mouth. This is erroneous; it rises to the northward and eastward to its mouth, and its general course is northwest and southeast, or parallel to the coast. The interior appears to be broken into a succession of sharp mountain ranges separated by narrow and deep valleys, similar to those between the islands of the coast. In fact, the topography of the archipelago is a type of that in the interior. A submergence of the mountain region of the mainland would give a similar succession of islands separated by deep and narrow fiords.

It appears from the testimony of miners who have penetrated far into the interior in search of gold, that there is a broad plain stretching northwest and southeast, which separates the mountainous zone of the coast from a lofty range, called by

them the "Blue mountains." This is at the head waters of the Stickeen and other streams that cut through the narrow strip of our recently acquired territory, and it is probably the main dividing range or prolongation of the Rocky mountains.

THE MINERAL RESOURCES OF ALASKA.

The principal mineral wealth of Alaska, so far as it is at present known, consists chiefly in coal, copper, and gold.

Coal.—Coal beds have been worked by the Russians at several points, but chiefly at Kennai, on Cook's inlet. The quality, however, is not equal to that of the coal from Nanaimo, on Vancouver's island, to the southward.

It is here important to note that the many islands along the northwest coast, from Vancouver's northward, are not formed of volcanic rocks, as is generally supposed and stated by some writers, but that they consist of stratified formations, chiefly sandstones and shales, which are favorable to the existence of coal-beds, indications of which have been found at various points.

It is probable that the formations of Baranoff or Sitka island, and of Prince of Wales island, indeed of all the islands of that extensive archipelago, are equivalents in age of coal-bearing strata of Vancouver's island and Queen Charlotte's island. On the latter the existence of beds of a very superior quality of *anthracite coal* has lately been made known, and samples of it have been tested in San Francisco with satisfactory results. The extent and value of these beds have not been ascertained, but their existence is a most significant fact, and suggests that a continuation of them may be found in the prolongation of the same formation in the islands to the northward, within the limits of the recently acquired territory.

The points at which I made an examination of the stratified rock formations were at Sitka and the adjoining islands, and at the mouth of the Stickeen river. At these places they consist of sandstones and shales regularly stratified, and passing in some places into hard slates which project along the shores in thin knife-like reefs. All these strata are uplifted at high angles, and they give the peculiar saw-like appearance to the crests of the ridges. Some of the outcrops are so sharp that they have been used by the savage Koloshes as saws, over which their unfortunate captives were dragged back and forth until their heads were severed from their bodies.

Coal has been noted upon the island of Ounga, on the west side of Takharooskai bay, in two places. The beds are horizontal, and are probably lignite. Vancouver noted coal on Cook's inlet. The miners who worked for gold upon the upper part of the Stickeen river in 1862-'63, reported coal as existing there, but no satisfactory description of it has been obtained. Coal of superior quality, in broken and drifted specimens, has recently been found by my brother, Mr. Theodore A. Blake, geologist of the Alaska expedition of 1867, along the course of a small stream which empties into St. John's bay, north of Sitka. The beds could not be found, and their extent is consequently unknown. *

It is surprising that during the long occupation of the northwest coast by the Russians little or no attention was given to explorations of the interior. Even the island of Sitka has not been explored.

Copper.—It has long been known that large masses of native copper are found along Copper river, which flows into the Pacific between Mount St. Elias and the peninsula of Kennai. Some of these masses, shown to me by his excellency Governor Fourchelm, at Sitka, very closely resembled the specimens formerly picked up on the shores of Lake Superior. From all the information which I received, I am inclined to believe that a copper-bearing region, similar to that

* Reports on Russian America, Ex. Doc. No. 177, 40th Congress, 2d session, p. 320.

of Lake Superior, exists in the interior. It is interesting that large masses of native copper have recently been found in northern Siberia. A large mass was exhibited at Paris, in the Exhibition, from the Kirghese steppes. It contained native silver, in isolated masses, identical in its appearance and its association with the singular masses of Lake Superior. Native copper, associated with silver, thus appears to be a characteristic mineral of the northern regions of both continents.

Gold.—The stratified formations of the archipelagos along the coast are not favorable to the existence of gold-bearing veins, for the metamorphosing agencies which usually accompany the formation of mineral veins do not appear to have acted upon the rocks with sufficient strength. East of the islands, however, and in the first range of mountains of the mainland, the conditions are different. The rocks are changed into mica slate, gneiss and granite, and are traversed by quartz veins which are presumed to be gold bearing. However this may be, it is certain that extensive sources of gold exist in the interior, for the sands of the streams that descend to the coast all contain gold.

Gold has for many years been known to exist upon the Stickeen, the Takou, and the Nass rivers. It has since been reported from many other places widely separated. Upon the Stickeen considerable mining has been carried on by both United States and English miners who followed the gold-bearing zone from Frazer's river northwards. It is to these miners that we are indebted for the discovery of the metal in paying quantities upon these streams, and for much of our geographical knowledge of the interior.

There is every reason to believe that this gold region of the interior extends along the mountains to the shores of the icy sea, and is thus connected with the gold regions of Asia.

At the time of my visit to the Stickeen river, in 1863, an account of which is annexed, there was conclusive evidence of the existence of a gold field of considerable extent in the so-called "Blue mountains," at the sources of the rivers mentioned. It is probable that there are zones of gold-bearing veins in those mountains which supply the gold to the detritus of the rivers. The severe climate, which prevents all placer or deposit mining, where water is used, during the winter months, would not materially hinder vein mining operations carried on below the surface. In this point of view a region of gold veins along those mountains has great prospective importance. The Stickeen river and other streams cutting through to the coast afford the most direct and cheapest routes to that region, and all information upon them has an immediate practical value. Some observations in detail upon the gold deposits along the Stickeen will be found in the general description of that river.

Platina is said to be abundant with the gold of the north fork of the Stickeen.

ICE.

It is probable that the ice of some of the large glaciers which descend from the mountains to the navigable waters of the coast may be shipped with profit to San Francisco and other places.

Although the ice is not as clear and transparent as that taken from lakes and ponds, it is nevertheless quite firm and solid, and may be used for ordinary purposes. Ice of this character can be obtained from the end of the second glacier on the Stickeen river.

In this connection the following notes upon the occurrence of great bodies of ice, undoubtedly glaciers, in the more northern parts of Russian America, have a special interest:

According to Sir Edward Belcher* the shores of Icy bay, at the foot of Mount

* Voyage of the Sulphur, i, 78-80.

St. Elias, lat. 60° , are lined with glaciers. "The whole of this bay, and the valley above it, was found to be composed of (apparently) snow-ice, about 30 feet in height at the water cliff, and probably based on a low muddy beach." At Cape Suckling, in the same latitude, and west of Icy bay, the same voyager observed a vast mass of ice sloping to the sea, the surface of which presented a most singular aspect, being "one mass of four-sided truncated pyramids." He was not able to account for this and observes, "What could produce these special forms? If one could fancy himself perched on an eminence about 500 feet above a city of snow-white pyramidal houses, with smoke-colored flat roofs covering many square miles of surface and rising ridge above ridge in steps, he might form some faint idea of this beautiful freak of nature."

Vast bodies of ice terminating in cliffs upon the sea are numerous in Prince William sound, and the thundering noise of the falling of large masses of ice was heard by Vancouver.*

On the shores of an arm of Stephens's passage (northwest of Sitka) a compact body of ice extended for some distance at the time of Vancouver's visit, and from the rugged valleys in the mountains around, immense bodies of ice reached perpendicularly to the sea, so that boats could not land. Similar observations are made, in general, of the mountains of the coast opposite Admiralty island. Two large open bays north and west of Point Couverdeen are terminated by solid mountains of ice rising perpendicularly from the water's edge.

From these various observations we may conclude that the mountain region of Russian and British North America, from latitude 55° to the Polar sea, is dotted with glaciers, cutting and scoring the mountains as they descend, and pushing their accumulations of rocky debris either into the ocean or the rivers of the interior.

GENERAL DESCRIPTION OF THE STICKEEN RIVER.†

The principal river in the vicinity of Sitka is the Stickeen, which rises in the Blue mountains, opposite the head waters of the Mackenzie, and flows in a general southeasterly direction, parallel with the coast, until it breaks through the mountains east and a little south of Sitka. When the snows are melting the river becomes much swollen, and is then navigable, with some difficulty, by small steamboats for 125 miles or more above the mouth. The valley is generally narrow, and is not bordered by a great breadth of alluvial land, except near the first great bend or turn of the river, where it breaks through the mountains of the coast. At this point there is a broad valley extending far to the southeast, along which Indians can travel to Fort Simpson in six days.

The sides of the mountain ranges are steep and rugged, and are covered, where there is sufficient earth, with a dense forest of coniferous trees, the timber of which is thought to be superior to that on the coast for spars and other purposes. The upper portions of the high ranges and peaks are covered with snow, and are truly Alpine in their character.

The narrow strips of bottom land on the sides of the river, and the islands between the different channels and sloughs, are almost all low, and seem to be liable to occasional inundations. The soil of such lands is loose and sandy, but fertile, and supports a vigorous growth of alders and the cottonwood, or an allied species of poplar. This poplar is abundant and attains a large size, often three feet in diameter. The wood is soft and light, is easily wrought, and is especially well adapted for the interior portions of cabinet furniture. The Indians use this wood for their canoes, cutting them out of a single log. Immense numbers of these trees are carried down by the stream, and are lodged

* iii, 1-5, (1794.)

† A portion of the following description of the Stickeen was published by the writer in the *Sacramento Union*, California, July 21, 1863.

in heaps on the sand-bars and islands, or are left as snags in the channel, anchored by the roots and pointing down stream, as in the Mississippi. The broad flats at the mouth of the river are also strewn with these trees, and many are doubtless carried far out into the sound.

My knowledge of the upper portions of the Stickeen river is derived from the miners who came down from the mining settlement during our exploration of the river. One of these miners was an old Californian, and a native of Vermont, and gave me much information which he had obtained in his travels and sojourn upon the upper portions of the river.

The head stream or branch of the river is said to flow in a northwesterly course along the foot of the Blue mountains, receiving many small tributaries from the valleys. Nearly under the parallel of 60 degrees it turns to the south-east, and for fifty miles cuts across a comparatively level country, described as a great plain with no obstruction to the vision. The stream here receives a fork or branch from the northwest and enters a very mountainous region, and for eighty miles is hemmed in on both sides by precipitous and overhanging masses of rock. This is called the Great cañon, and its upper portions are very imperfectly known. The river is said to make some very great bends, which, together with the dangers of the cañon, have been avoided by the miners. They leave the stream and cut across the country on foot. In one place the walls approach so closely that the stream during floods has not room to pass freely, and the waters are dammed up so as to produce a cataract some sixty feet high. The space between the walls at the top, where the surface of the flood rushes through, is considered to be only six feet wide. Just below this waterfall a tributary enters from the southeast and is known as the South fork, and still lower down the valley, the Second North fork and the First North fork enter the right bank from the northwest, and within six miles of each other. These two streams extend far to the northwest, and have been worked for gold.

Near the mouth of the First North fork there is (1863) a village of Stickeen Indians, and below the cañon, at intervals of five or six miles, there are several mining camps, known, respectively, as Buck's bar, Carpenter's bar, and Fiddler's bar, down to Shek's bar on the right bank.

From Shek's bar downward the course of the river is nearly southeast and parallel with the coast. Fifty miles below the river cañons again and ruins with great force through a narrow gorge, with vertical precipices on each side. This is known as the Little cañon, and is much dreaded by the Indians and those who ascend the river. It does not, however, offer any great obstacle to the passage of a steamboat.

About 60 miles below this cañon the river turns westward and breaks through the Coast mountains for some twenty or thirty miles to the mouth in the straits or sounds between the islands that border the coast. The total length of the river is estimated at about 300 miles. Further data upon this point will be found in the journal.

CURRENT AND NAVIGATION.

The velocity and strength of the current throughout the whole length of this river, except perhaps the portion above the great cañon, is, perhaps, its most remarkable feature. Without any falls or impediments the current sweeps down with great uniformity, and in most places is so swift and strong that it is useless to attempt to make headway against it with oars, and when the bed or banks are not suitable for towing or tracking the only way to force a boat up is by means of poles, taking advantage always of the least forcible parts of the stream. The line for towing a boat should be from 200 to 300 feet long. The velocity of the current was measured at several places, and in the portions of the river below the Little cañon probably averages five miles per hour, and in the lower portion, or for about 30 miles above the mouth, about four miles per hour.

The depth of the water is of course variable, but even at low water is seldom less than three feet in the main channel. The highest water, or season of the greatest floods, is in the month of July, when the snow is melting on the mountains most rapidly under the summer sun. At these times the height of the river, judging by the appearance of the banks, does not appear to be very greatly increased, probably not more than six feet; but the water spreads out over the low banks and islands, and the stream is thus greatly changed in its appearance and in the form and direction of its banks. The water is always charged with a very fine light colored powder or sediment, so that it is opaque and the bottom of the stream is not visible. This suspended material is probably derived from the glaciers, or may perhaps be washed down from soft stratified formations along the sources of the stream.

GEOLOGY, GOLD, MINERALS.

The mountains of the Stickeen valley, from the Little cañon down to near the coast, are formed of syenite and granite, with some metamorphic beds at intervals. The walls of the Little cañon are granite.

At the mouth of the river and below to the Indian villages the rocks are quite different, being formed of the great sandstone and shale formation already described. The direction of uplift of these strata is about north 80° west, magnetic. The formation is some thousands of feet thick, and resembles the rocks of San Francisco, but is more changed by metamorphic action. They are probably of the secondary period. It appears to pass into mica-slate just above the site of an old stockade or fort of the Hudson Bay Company, where I found a locality of garnets like those of Monroe in Connecticut.

In the drift of the river below the Little cañon there is an abundance of fragments of granite, porphyry, and limestone, and a notable absence of fragments of lava, from which I conclude that volcanic formations are not developed to a great extent in the interior.

Gold can be found in small quantities by panning the drift of the bed and bars of the river. I almost invariably found the color, but in particles so minute as to be difficult to see and more difficult to save. This, of course, was to be expected in trials of the sand and gravel from the surface. It is what is termed flour gold, and to collect it would require blankets, quicksilver, and greater care and attention than is generally given in the rapid methods of California. There was not time to make any excavations to the bed rock, where, doubtless, the coarse gold lies. Very good results can, however, be obtained in the layers of gravel above it, and the miners informed me that they seldom attempted to reach the bed-rock, it was so far below the surface. Some of the best results of their mining were obtained in a layer of gravel about 18 inches below the surface. This 18 inches of gravel is skimmed off and thrown aside, and the next five or six inches of gravel below is washed in cradles or rockers. The principal mining at Fiddler's and at Carpenter's bars in 1862 was of this description. One claim of 200 feet square, worked by two men, yielded \$2,000; and the bars are reckoned to yield from \$3 to \$10 a day to the hand. Nearly all the bars will yield from \$1 to \$1.50 per day. The extent of paying ground is much increased as the river falls, and doubtless the bed of the river is extremely rich. Unfortunately the time of lowest water is during the winter months, when all is locked in ice, and, of course, washing is then impossible.

The gold from the North fork of the river is the coarsest which has yet been found or reported upon the Stickeen, (1862-'63.) One lump was worth \$9.75. Even on this stream the bed-rock has not been seen except at one or two places, and it was believed that to reach and work the gravel upon it, derricks, pumps, and other machinery would be necessary. The miners say that this North fork is subject to extensive landslides along its course, which bring masses of earth

and rocks into the stream and obstruct it until the force of accumulated water above sweeps everything clean before it.

I was impressed in ascending this river by the absence of any well-defined terraces or old deposits of drift along the mountain sides or on the low ridges. No terrace was seen until we were near the Little cañon, where they are well-defined and extend for a mile or two on either one side of the river or the other, and they are also found above the cañon. They rise some fifty feet above the stream, and are made up of coarse, heavy drift. If at such places the bed-rock could be reached above the level of the river, there is little doubt that they would pay well for working. No favorable till or dry diggings have yet been found above. An explanation of their absence may be found in the fact that the valley is so narrow and the current so strong that all drift accumulations are swept away.

The gold which has been brought by the Indians from the Takoun river further north is coarser than that found upon the Stickeen.

CLIMATE.

At the time of my visit—the last part of the month of May—the poplars and other deciduous trees were just budding, and in some places the young leaves had spread out. The nights, though cold, were not frosty; the thermometer seldom indicating less than 40 degrees. It was quite hot in the sun during the day, though in the shade the mercury seldom rose above 65 degrees. It is much hotter in midsummer. At Sitka, in the same latitude or a little north, there is not as great a difference between the summer and winter as upon the Stickeen. The winter at Sitka is not severe, and in 1862 there was not a crop of ice. The climate is said to be like a continued autumn. On the Stickeen, and in that interior valley, shut out from the influence of the ocean current, the seasons are strongly marked. The winters are cold, and the summers are hot. The river closes in December, freezes over, I am told, from its mouth up, and it opens in May. In the winter of 1862-'63 it was open as late as December 17, and in the spring the ice broke up about the 1st of May, and the previous year on the 9th of May. As soon as the warm days of spring cause the snows to melt, the river begins to rise, and so breaks up the ice. There is then a short season of rising and falling, after which come the continuous floods of the hot months. Very little rain falls during the summer in the upper part of the valley. Little or nothing was known in 1863 of the climate of the mountain region at the head of the Stickeen. At the mining camps at and near Shek's bar the winter is said to be very severe. Snow commences to fall in October, but is most abundant in December, and covers the ground to a depth of from four to fourteen feet or more all winter. In 1862 four feet of snow on a level fell in one day. In December the mercury sank below zero, and in February was solid in the bulb for nine days continuously. There was no thawing or rain during the winter.

It is perhaps this alternation of the seasons that causes the timber of the interior to be superior (according to report) to that of the coast.

FISH AND GAME.

Salmon, halibut, and other good fish abound at the mouth of the Stickeen. When the salmon ascend the river in June and July the Indians follow, and catch them in great numbers. They split them along the back, remove the backbone, cut them in long strips, and dry and smoke them. When well cured they are very fine, and are very convenient in camp. Ducks and geese may be shot on the river, and grouse in the forests of the shores. Bears are plenty in the mountains, and the mountain sheep or goat in the rocky places. Beaver and otters are taken in great numbers by the Indians of the Valley and its tributaries.

JOURNAL OF AN EXPLORATION OF THE STICKEEN RIVER—1863.

Under the orders of Admiral Popoff, of his imperial Russian majesty's navy, an expedition for the survey of the Stickeen river was organized by Lieutenant Bassarguine, commanding the corvette Rynda, when at Sitka in 1863.

The corvette steamed from Sitka to a convenient anchorage a few miles below the mouth of the Stickeen and near the south shore of its broad estuary. The party detailed consisted of Lieutenant Pereleshin, Mr. Andreanoff, a Russian engineer in the service of the Russian American Company, six Russian sailors, expert oarsmen, and the writer, who accompanied the party as a guest for scientific purposes. The commander's gig, a boat sharp at both ends and modelled like a whale-boat, was selected as best adapted for the purpose, and was fitted out with mast and sail, a long line for towing, and was provisioned for two weeks. An Indian named Jack accompanied us as a guide.

May 23, 1863.—*Corvette to Camp 1.*—We left the corvette in the morning and rowed up the stream, following the left or southern bank. The space between the mountains occupied by the estuary is apparently from two to three miles wide, and there are several channels or mouths separated by islands bordered by extensive sand-banks, where numerous large trees brought down by floods have been stranded. The mountains on the south side come nearly to the water's edge. They are apparently from 1,500 to 3,000 feet high, and are heavily timbered with firs and spruce. The rocks are granitic and metamorphic, and they project in long points, at one of which we stopped at noon to dine, opposite an island called Koknook by Jack, our Indian guide.

Mica slate in large blocks lay along the beach, and several beautiful crystals of garnet were picked up. These are about the size of filberts and closely resemble the garnets found in similar slate at Monroe, in Connecticut. The color is good, but the crystals are not transparent or free from flaws, and therefore have no value for the lapidary, although interesting to mineralogists. This rock shows a high degree of metamorphism.

One of these rocky points, where there is some flat land, is occupied by an Indian village, at which we procured some very fine smoked salmon. The fish has a fine red color, is very fat, and has an excellent flavor.

Beyond Koknook island the channel narrows rapidly and the course of the stream is nearly northeast and southwest. The shore on the north and west is quite low. The mountains on the south descend nearly to the shore and appear to be the ends of ridges trending northwest and southeast. The principal mountain abuts upon the river and forms a conspicuous point about five miles above the island. We camped at this point at 6.30 p. m. The river appears to be not over 200 yards wide, and the valley begins to narrow. The ranges on the north side approach the right bank.

We gave the name of the corvette to the mountain above our camp, and the name of the commander to the mountain opposite it on the right or north bank. Both of these mountains appear to be formed of a dark-colored gneiss, which at the camp trends northwest and southeast, and is nearly vertical. It is a metamorphosed sedimentary rock.

May 24.—*Camp 1 to Camp 2.*—We left camp at 5 a. m. A short distance above, and on the left bank, there is an extensive sand-flat which is bare during low stages of water. There is a belt of alluvial or bottom land beyond it, while on the north or right bank the mountain impinges upon the stream. About two miles above camp the conditions are reversed; the alluvial land is on the north side, and the mountains on the south jut out into the river in a series of rocky points, which the guide called Stinenia. The rocks are gneiss and granite. From this point there is a fine view of a glacier descending between the mountains a mile or two westward. It has a high inclination and a very rugged and broken surface. The sides of the mountain along its course show freshly broken

cliffs, which are clearly the result of the eroding action of the ice. We designated this as the "Popoff glacier" in honor of the admiral. The Soynai or Ice-water river, according to our guide, enters the Stickeen a short distance above and probably flows from the glacier. The point of land between the Soynai and the Stickeen appears to be formed chiefly of coarse river drift, with probably considerable debris from the glacier, and it contains gold. It had been marked off into claims by some miners who had passed up the river in Indian canoes. This gold is said to be quite fine and is in thin scales. Another stream, called the Ketili, enters on the right bank a short distance above, and a brook, the Shuktusay flows in nearly opposite it.

The course of the Stickeen for several miles above is nearly east and west, and there are no rapids or impediments to navigation by vessels of light draught. There are several long sand-bars and low islands on the south side of the main channel. On the north the banks are low, and the mountains recede from the river towards the northwest.

The deciduous trees along the bottom lands are just budding out, and the air during the day is mild and spring-like, although there is yet some snow remaining along the banks on the north side, and on the low bars that have been above water during the winter.

About four miles above the mouth of the Soynai, the river turns suddenly to the north and then to the northwest. At the bend, the mountains on the south side rise abruptly from the water, and are composed of syenitic granite.

We camped a short distance above, on the right bank, and nearly opposite the mouth of a stream which enters the Stickeen from the southeast. It is called Kéticé by our guide. Another stream, or a branch of the first, enters about a mile below, and was designated as the Kekkikacié. The ground at our camp was low, and formed of the alluvium of the river, thickly overgrown with alders and shrubs.

This flat extends for a considerable distance to the west, and back to the mountains. The guide says that there is a lake, or large pond, at the foot of the mountains, where there is an abundance of geese and ducks. The river abounds with the finest salmon.

May 25 — Camp 2 to Camp 3.—We left camp at 6 o'clock in the morning, and rowed for some distance; temperature of the air 44°. The first prominent rocky point is formed by the end of the range on the north, which here terminates the belt of bottom-land. The rocks are gneiss and mica slate, with the stratification nearly vertical, and trending northwest by west. This point is well adapted for a settlement or supply station, as there is a good landing, and it is sufficiently elevated to be secure from floods. The Indian calls this point, and the mountain above it, Kokaydai.

From our camp this morning, and along the river below it, there is a fine view of a ridge of the mountains, with the most remarkable serrations and sharply cut peaks of rock, looking like the sharp points of crystals penetrating the air.

There appears to be a branch of the river just opposite Kokaydai Point, and a broad opening, extending far to the southeast, indicates a valley in that direction. This is distinctly seen about three miles higher up the river, where a stream enters, called the Scoot, but which may be another mouth or branch of the stream which drains the valley. The Indian describes it, as nearly as I could understand him, as a very large stream, extending a great distance. The valley affords fine hunting and fishing, and has many Indians who trade with the Stick Indians. This valley affords a direct route to Fort Simpson, and an Indian can traverse the distance in six days.

In an abrupt point of rocks jutting into the river half a mile below the Scoot, a quartz vein, some ten inches thick, was observed. The rocks are hornblende and very dark-colored. The end of a magnificent glacier is visible on the right bank of the river, a few miles above.

At a point a short distance above the Scoot there is an Indian village. These Indians are quite different from the Koloshes of the coast, and are evidently of the great Chippewyan family. They offered skins of the sable for sale or barter, and had several fine skins of cubs of black bear recently killed.

The glacier above presents a splendid appearance in the sunlight, and extends for about two miles along the stream. The background is formed by beautiful snow-covered peaks, from between which the glacier issues, but its source cannot be seen. The slope of the glacier is very gentle, and the vast body of ice appears to be unbroken until it reaches the valley of the river, where it breaks down in massive ledges and pinnacles of the purest crystal. The foreground along the stream consists of an ancient moraine now covered with trees, among which willows and poplars are conspicuous in their delicate green foliage of spring. Some very large blocks of granite standing in the river bear witness to the vast transporting power of ice and to a much greater extension of this glacier in former periods.

From this part of the river a line of high and rugged peaks is visible on the right or eastern side of the valley, and at a considerable distance from the stream.

The accumulations at the foot of the glacier have evidently pushed the river outward, and they have acted as a dam to the waters, which above the moraine are quite deep and flow smoothly. We encamped at 8 o'clock on a gravelly beach, diagonally opposite the glacier.

May 26.—*Camp 3 to Camp 4*.—We left our camp at 3 o'clock in the morning, and found the ascent of the river more difficult than it had been, owing to the increased velocity of the current and the irregularity of the banks. The stream turns more to the west and is quite crooked. The valley is narrower; large poplar trees are abundant along the banks, and many that have been uprooted by the undermining action of the stream are stranded upon the sand-bars and along the shores.

At 9 o'clock we stopped to rest the men, who were fatigued with the incessant hard labor of rowing and tracking the boat. Temperature of the air 63° Fah. in the shade. The sun shone out bright and was quite hot. We came in sight of another and very beautiful glacier, flowing from a valley on the west. It is remarkable for its symmetry, regular slope, thickness of the ice, and for the contrast with the dense forest on each side of it, and with the belt of deciduous trees upon the bottom-land in front. In the extreme background there is a magnificent angular peak shrouded with snow.

The drift, pebbles, and rocks of the river bed at this point, and a short distance above, consist chiefly of limestone, porphyry, and jasper, with some masses of quartz.

There are numerous bends and crooks in the stream, and an appearance of another channel to the right, on the other side of low land, covered by trees. A stream called the *Clitch-a-ta-noo* enters on the left bank. After passing an abrupt bend in the river, where the current was very swift, we encamped at 7.25 p. m. on the right bank.

May 27.—*Camp 4 to camp 5*.—Left camp at 7 a. m. Morning bright and clear. The rock at camp is a compact white granite, evidently a metamorphic rock. The trees are very large, and have an abundance of heavy green moss upon them. From this part of the river there is a splendid panorama of high peaks and mountains. The current is swift, and there are many bars and channels. The day was quite warm, and we stopped to rest and dine at a beautiful point where some United States miners had made a camp in 1862. About 60 men spent the winter here, and had a store or stock of provisions for sale to the miners, who had taken claims in the vicinity. One of their number died of small-pox, and was buried at the foot of one of the largest spruces. The scenery at this part of the river is very picturesque. The rocks at the point are

metamorphosed sandstones and shales and pass into gneiss. The drift and sand-bars of the river contain gold, but no very great amount of work appears to have been done. We camped on the left bank of the river, above the bend, and upon a low bar. A mountain behind us, to the northeast, bears the name of Hanook. A small stream of clear, cool water enters a short distance below. I found the "color" of gold here in the surface gravel, and Jack shot a wild goose for supper.

May 28.—*Camp 5 to camp 6.*—A mountain in view from camp, and which is covered with perpetual snow, is called *Taouk-ti-nia*, and the Indian describes a "big water" on the east which he calls *Ska-ti-ni*, and says that the Indians catch large quantities of salmon there and dry them. We stopped for half an hour to lash the provisions to the seats of the boat, so that in the event of capsizing they would not all be lost. Each man also took a small quantity of bread and dried salmon in his pockets. We were nearly capsized three times during the morning. The current was so strong and swift that it was not possible to make any headway by rowing, and the boat could not be got up some of the swift places except by poling or tracking. The sailors have been in the cold water up to their waists, part of the time, pulling the boat. We passed another glacier coming down from the mountains on the west. It is called *Ka-ra-kai* by Jack. The shore opposite to it is rocky, and a reef of granite projects into the stream.

We made two trials of the velocity of the current to-day by timing the passage of bottles and sticks thrown into the stream floating down with the current over a measured distance. This showed a mean velocity of 5.20 miles per hour. We encamped upon a sandy bank on the north side of the river and a short distance above the glacier. The long twilight is interesting, it being quite light even after 9 o'clock in the evening.

May 29.—*Camp 6 to camp 7.*—Found some coarse drift along the river in which I obtained the color of gold upon washing in a pan. Masses of white limestone occur in that drift. The course of the river is crooked, and there are many bars and side channels. Camped in a bend of the river upon the right bank of one of the channels (probably upon an island) and took numerous bearings by compass to prominent peaks. A fine conical mountain bears north 17 east.

May 30.—*Camp 7 to Cergayef rapid and back.*—At the previous camp I observed trees of the white birch for the first time upon the river. At this camp we saw the nest of a bald-headed eagle in a cottonwood tree, and found the grave of an unknown white man whose body had been picked up on the shore and buried by some miners who had ascended the river a year before. Beavers are abundant in this vicinity; their trails led in various directions over the bottom-land, and many small trees, over three inches in diameter, had been cut down by them. At camp, and above, gold was found on trial in the drift along the shore. This drift is quite coarse and heavy, and consists of syenite, porphyry, and limestone. The appearance of the banks is such as to lead me to conclude that the river is not subject to great floods. The marks of high water in favorable places do not indicate a total rise of over five feet above the present level. We were now approaching the much-dreaded cañon, where the whole volume of the stream flows through a narrow rocky gorge, and is thrown into such eddies and whirlpools that many Indian canoes have been capsized and carried down.

A fine conical mountain upon the east side of the river has been visible for a great distance, and marks the position of the lower end of the gorge through which the river has broken its way. We called this "Cone mountain," and it is so indicated upon the map. Some of the ridges which extend from it project upon the river and are composed of granite.

We were two hours and a half in passing the cañon. The sides are formed of precipitous cliffs of granite roughly broken out, and the water rushes between

them with great force, boiling and whirling as at Hell-gate near New York, when the tide is flowing rapidly. On the north side, for a part of the way, there is a reverse current setting up stream, of which we took advantage in passing through. Towards the upper end some of us landed upon projecting points of rock and helped to tow the boat.

The stream above the cañon is much wider and flows quietly between terraced banks. It is evident that the rocky contracted channel of the cañon has acted as a dam, setting back the waters of the river, and at some former period causing them to spread out over the country. The terraces are most distinct upon the south bank, and are composed of coarse river drift and are well wooded. A high range of mountains, with snow upon the upper portion, extend behind these terraces. On the opposite side there is a rough and broken range which appears to extend back of Cone mountain. To this range, or perhaps to the principal peak, the Indian gives the name *Sa-kai-na*.

After passing the terraces and the quiet portion of the river opposite to them, we reached a dangerous rapid, where the main current rushes over and among large rocks and boulders. The men were out towing, and in attempting to return to the boat, one named Cergayef was swept from his feet and drowned without our being able to reach him. This sad event put an end to our attempt to ascend to Shok's bar, where some miners were at work, and after landing and holding services, according to the forms of the Greek church, we prepared to descend the river.

May 31.—Camp above the Little cañon to camp opposite the glacier.—We left camp at eight o'clock in the morning on our return. Temperature of the air 44°. In half an hour we had reached the lower end of the cañon and passed safely through it without difficulty. We found at once a very great difference between ascending and descending the stream, for we passed in a few hours over the distance which it had taken us days to overcome.

At 9^h 25^m we passed camp 7, and camp 6 at 10^h 55^m, camp 5 at 12^h 10^m, and at 12^h 35^m reached American Point and stopped for dinner. Leaving this place at 2^h 35^m, we passed camp 4 at 3^h 41^m, and rested there to see Indians until 4^h 20^m. At 8^h 35^m we stopped to camp nearly opposite the south end of the second glacier. We had, however, stopped to explore the end of this glacier and to see some remarkable hot springs on the opposite side of the river, which occupied about an hour. We had thus accomplished the distance from the upper end of the cañon down to this glacier in nine hours and five minutes; and if we assume the mean velocity as five miles per hour the distance is a little over 45 miles.

The glacier was exceedingly interesting and presented all the usual phenomena of glaciers.* Two or more terminal moraines protect it from the direct action of the stream. What at first appeared as a range of ordinary hills along the river, proved on landing to be an ancient terminal moraine, crescent-shaped, and covered with a forest. It extends the full length of the front of the glacier. The following extract from my notes will answer for a description of the end of this glacier.

We found the bank composed of large angular blocks of granite mingled with smaller fragments and sand. It is an outer and older moraine, separated from a second one by a belt of marsh land, overgrown with alders and grass and interspersed with ponds of water. Crossing this low space we clambered up the loose granitic debris of the inner moraine, which is quite bare of vegetation and has a recently formed appearance. These hills are from 20 to 40 feet high, and form a continuous line parallel with the outer and ancient moraine. From their tops we had a full view of the ice cliffs of the end of the glacier, rising

*An article describing this glacier was published by the writer in *American Journal of Science and Arts*, volume XLIV, July, 1867, and also in the *Sacramento Union* for July 21, 1863.

before us like a wall, but separated from the moraine by a second belt of marsh and ponds. Here, however, there were no plants or trees. It was a scene of utter desolation. Great blocks of granite lay piled in confusion among heaps of sand (sand-cones) or were perched upon narrow columns of ice (glacier tables) apparently ready to topple over at the slightest touch. The edges of great masses of ice could be seen around pools of water, but most of the surface was

1.

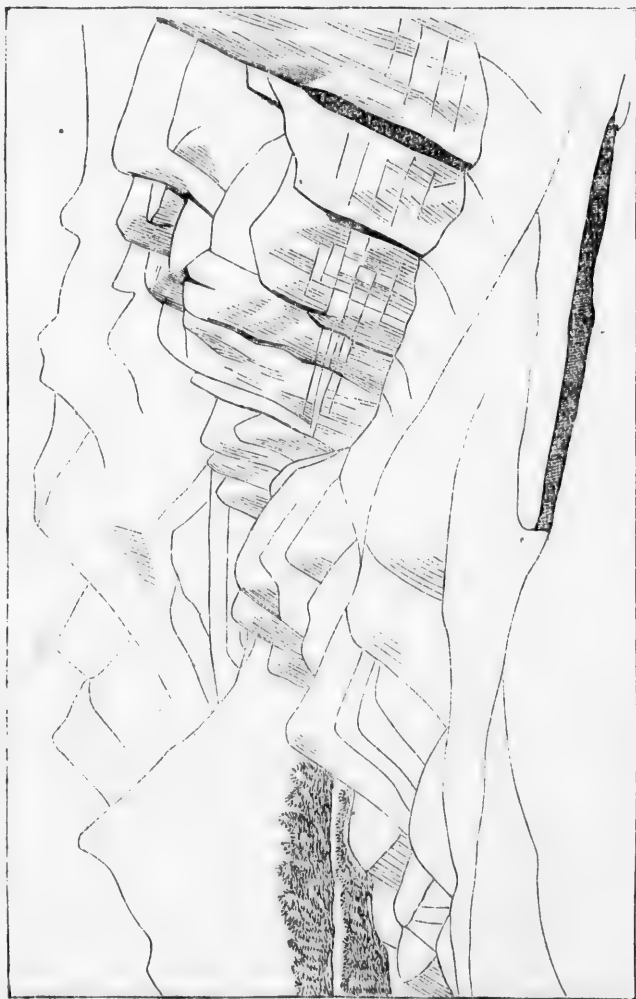


Ice-pinnacles at the end of glacier.

hidden by a deposit of mud, gravel and broken rock. It was evident, however, that all this was upon a foundation of ice, for here and there it was uplifted, apparently, in great masses, leaving chasms filled with mud and water. Over this fearful and dangerous place we crossed to the firmer and comparatively unbroken slope of ice at the foot of the bluff, and afterward had to climb over snow and ice only, in the attempt to reach the top of the glacier. From below,

it had appeared to us to be quite possible to accomplish this, if we followed the least broken part of the slope, but it proved to be difficult, and finally impossible. Fissures which could not be seen from a short distance were met at intervals, some of them being so wide that we were forced to turn aside. As we ascended, the crevasses were more numerous but were generally filled with hard snow, to which we occasionally trusted. The surface soon became precipitous

2.



Bluffs of ice. End of glacier, looking toward the southeast.

and broken into irregular stair-like blocks with smooth sides, and so large that it was impossible to make our way over them without ladders or tools to cut a foothold. Here we turned and enjoyed the sight of this great expanse of ice, broken into such enormous blocks and ledges. The sun illuminated the crevasses with the most beautiful aquamarine tints, passing into a deep sea-blue where they were narrow and deep. In one direction the ice presented the

remarkable appearance of a succession of cones or pyramids with curved sides. In the opposite direction and at the same level the outlines were totally different, showing merely a succession of terraces or steps inclined inward toward the glacier and broken by longitudinal crevasses. The annexed sketches were made from this point of view. No. 1 is taken looking up the river, over the end of the glacier, and shows the pyramids of ice. The line of ponds and the two moraines are seen at the base, and the river on the extreme right. No. 2 shows the appearance of the glacier in the opposite direction. A broad fissure between one level of the ice and the next is filled with snow.

It is evident that this glacier breaks down in a series of great steps or ledges along the greater part of its front. These steps rise for 20 or 30 feet one above the other, and thus produce a stair-like ascent, while at the same time the numerous parallel fissures at right angles break the surface into rectangular blocks, which on the side exposed to the sun soon become worn into pyramids and cones. The difference of outline in opposite directions is thus explained.

I was inclined to regard the melting action of the water of the river as the cause of this abrupt breaking off of the end of the glacier. There may, however, be a sudden break in the rock foundations at this point, so as to produce an ice-cascade. The following section will perhaps give a clearer idea of the manner in which the glacier breaks down.



Section of end of glacier.

One or more streams descend under the glacier, and reach the river at different places. The rushing and roaring sound was rather startling at some of the crevasses.

Judging from the number of loose blocks of rock at the foot of the glacier, the upper surface must be strewn with them, but this could not be verified by observation. Time did not permit a more extended examination. There would be little difficulty in gaining the surface of the glacier from the side, and, perhaps, at some other points along its front. It was impossible to get our Indian guide to accompany us. They have a tradition of the loss of one of their chiefs upon this glacier.

The ancient terminal moraine of this glacier is significant of an amelioration of the climate. It is also interesting to note the effect which this accumulation of materials from the glacier has had upon the river. It has acted as a dam for the waters, setting them back in the valley for some distance.

Only a short distance below the point where the ice-cold water from the melting of the glacier enters the Stickeen there is a small but deep stream of clear water entering from the opposite side. We turned the boat up this stream for about 100 yards and found the water quite warm, having a pleasant temperature for bathing. Higher up, the stream divides, one branch comes from the mountain and is clear and cold, the other is hot, and rises from a group of springs near by. The vegetation around was remarkably green and luxuriant, and there appeared to be a considerable area of heated ground. By covering these springs with a glass house, one could have a tropical climate inside, all the year, and enjoy the beauties of tropical vegetation in full sight of the cliffs of pure ice directly opposite. These hot springs exhibit the not unusual phenomenon of a luxuriant growth of confervæ in the midst of the hottest water.

June 1.—From the glacier to the corvette.—The temperature of the air at

our camp on the bank of the river was 43° F. at 11 p. m., (May 31.) At 7 o'clock in the morning the mercury stood at 45°, which was the temperature of the river water also.

Our Indian guide, Jack, could not be found this morning; he had quietly run away during the night, fearing, perhaps, that we would hold him in some way responsible for the loss of the sailor Cergayef. We were sorry to have him part with us in this way, for we felt grateful for his untiring and faithful efforts to assist us in the undertaking, and we highly appreciated his skill in the management of the boat in difficult places.

We left at 8 h. 21 m. a. m., and passed our first camp at 4 h. 37 m. p. m., having been detained two hours and nine minutes on the way. At 6 p. m. we reached the mouth of the river, and at 7 p. m. were alongside of the corvette. We had been in motion for eight and a half hours, at an estimated rate of four miles per hour, giving the distance as 34 miles (approximately) from the anchorage to the glacier.

The total time occupied in descending the stream, exclusive of stops, was 17 hours and 35 minutes, in which we accomplished a distance of 80 miles, approximately, which had required eight days of hard exertion to overcome in ascending against the current.

Distance along the Stickeen river by estimates obtained chiefly from the miners who came down from Shek's bar to the mouth of the river in May, 1863.

	Miles.
Mouth of the river to the Little cañon.....	75 to 100
Lower cañon to first north fork of river.....	20
Lower cañon to Shek's bar.....	50
Shek's bar to Upper or Long cañon.....	20
Mouth of Long cañon to first north fork.....	16
First north fork to second north fork.....	6
Length of cañon.....	80
Head of cañon to the Blue mountains.....	50
Length of river along Blue mountains*.....	100

ESTIMATE OF LENGTH OF THE RIVER.

Mouth of the river to Little cañon.....	75
Little cañon to Shek's bar.....	50
Shek's bar to Upper cañon.....	20
Length of cañon.....	80
Upper end of cañon to Blue mountains.....	50
Along and in the Blue mountains*.....	100
Estimated length of river.....	375

* It is thought that the length of stream along the Blue mountains is overestimated.

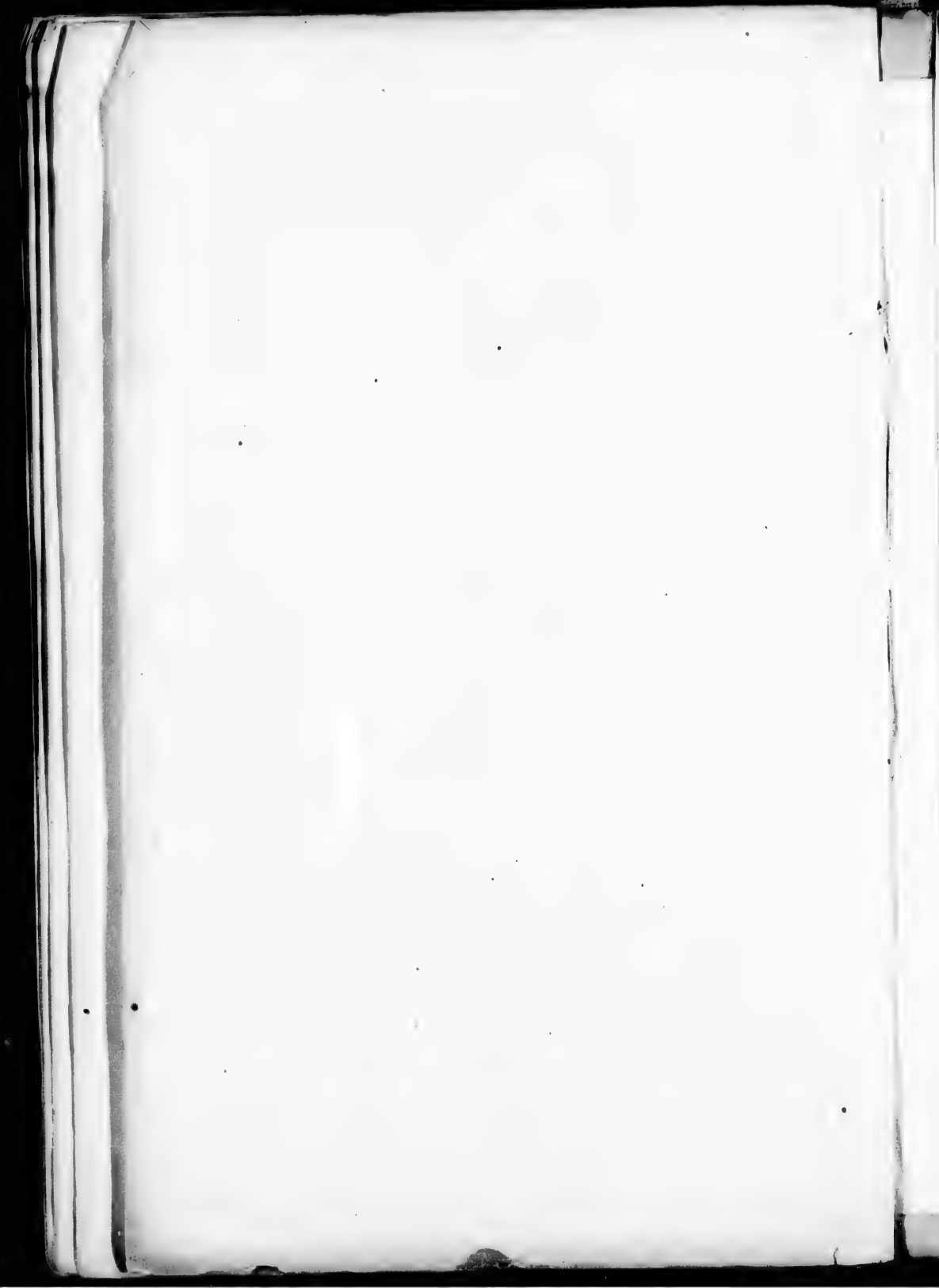
Partial exhibit of the fur production of Russian America.

[Compiled from the report of Golowin, 1860.]

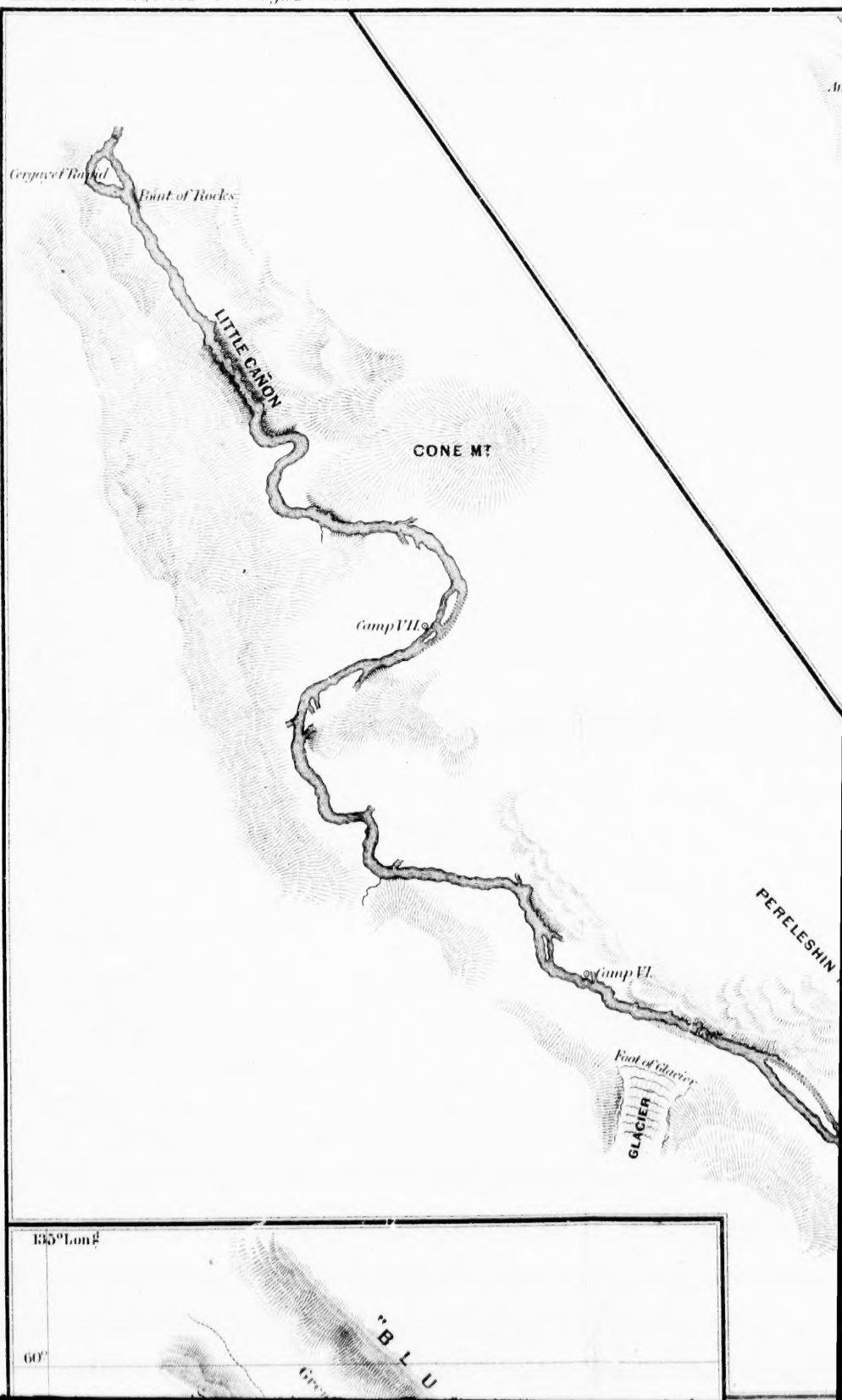
Where from.	Sea beavers.	River beaver.	Otter.	Fox.	Bear.	Sable.	Fur seal.	Tails of sea beaver.	Lynx.	Wolf.	Muskrat.	Arctic fox.
Sitka, from the Koloshes, 1843 to 1860	1,040	2,779	1,196	481	282	1,455	3	1,056		22	90	
From the Koloshes, in the straits	495	382	181	109	89	128						
By exchange with the English			21,873	692				626	2,625	58	14,313	
Kodiak department	5,809	85,381	9,558	28,049	1,597	14,285	3	1,157		13		
Unalaska department	5,686		329	19,671			1,687	1,048				
Atka islands	1,888			1,420	5,785			687				
Attou islands	2,421				2,503		9,586					
Behring's island					6,496			214				
Unga island	3,611		979	5,731						1	4,668	
Michaelofsky redoubt		48,398	4,954	10,211	1,403	8,253				1		
St. Paul island							277,778					10,508
St. George							31,923					24,286
The total production for ten years is given as follows.	25,602	161,042	63,826	73,944	2,283	26,384	338,604		6,445	104	19,076	55,540

List of geographical names obtained from the Indian guide Jack, in ascending the Stickeen river.

Indian name.	Objects to which the name was applied.
Kok-nook	Island at the mouth of the river.
Ka-té-té	Point.
Tas-a-ki-li	River.
Scot	River.
Ké-ti-li	River.
Shuk-tu-sé	River.
Soy-nai	River.
Ki-ka-hé	River.
Tuk-i-smook	Point.
Klitch-a-ta-noo	River.
Koosh	Creek and waterfall.
Tiet-lia	A fine mountain peak.
Sca-ti-ni	"Big water."
Ka-ra-kai	Glacier.
Sak-ai-na	Mountain.
Klig-koss	Waterfall.
Kak-wan	Point.
Sti-pé-nia	Point.
Touk-ti-nia	Mountain.
Ha-nook	Mountain.
Sha-stets-sa	River of ice-cold water.
Shi-ton-i	The long-leaved spruce.
Su-sun-i	The short-leaved spruce.
How	The hemlock tree.









60°

55°



THE STICKEEN RIVER

From Survey in 1863, and Information obtained
by
WILLIAM P. BLAKE.

To accompany a Report to Hon. W. H. Seward, Secretary of State. 1868.

